CONVEYING DEVICE

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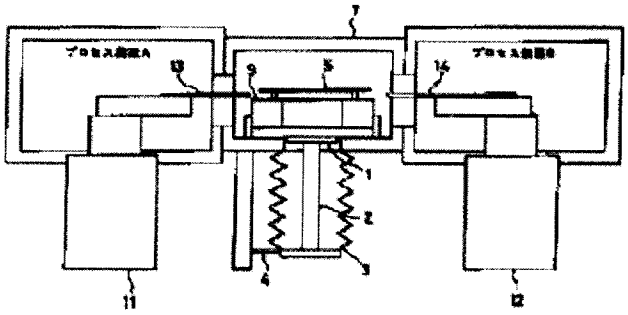
Abstract of **JP7108159**

PURPOSE:To provide a tunnel conveying device capable of smoothly transferring an object to be transported such as a wafer in a boundary region between a process device and the tunnel conveying device.
CONSTITUTION:In this device provided with a carrying truck 9 mounting the object to be transported in a tunnel 7 and carrying the object to be transported in such the state that the outdoor air is cut off with a tunnel partition, a mounting table 1 mounting the object to be transported 5 is placed in the tunnel 7 and the mounting table 1 is moved vertically while cutting off the outdoor air from the inside of the tunnel 7 as it is, and passage of the carrying truck 9 is not hindered by the movement of the mounting table 1.



CLAIMS

[Claim(s)]
[Claim 1]In a tunnel conveying machine which conveys carried one where it had a carrying truck which carries carried one in an inside of a tunnel and the open air is intercepted by a tunnel septum, A conveying machine characterized by moving a table which lays said carried one in an inside of said tunnel, and this table to a sliding direction with the state where said inside of a tunnel intercepted the open air, and keeping movement of this table from passing of said carrying truck being barred.
[Claim 2]The tunnel conveying machine according to claim 1 which equips said carrying truck with an opening penetrated to a sliding direction, and is characterized by said table being movable to a sliding direction in inside of this opening.
[Claim 3]Inside of an opening which height of a conveyance face of a robot to which carried one which has been arranged at both sides of said tunnel conveying machine is transported differs, and is penetrated to a sliding direction of said carrying truck by a means to make said table go up and down. The tunnel conveying machine according to claim 2 provided with a means to transport carried one between robots with which height of said conveyance face differs.
[Claim 4]The tunnel conveying machine according to claim 1 to 3, wherein the hermetic seal of said table is carried out to an opening of the undersurface of said tunnel septum, or the upper surface by bellows mechanism and an elevator mechanism and it is supported by sliding direction movable.
[Claim 5]The tunnel conveying machine according to claim 1 to 4, wherein said tunnel conveying machine is a linear motor type track.
[Claim 6]The tunnel conveying machine according to claim 5, wherein said linear motor type track is a thing which makes it run said carrying truck in the state where it was made to rise to surface from the tunnel outside with magnetic attraction power of an electromagnet for surfacing which equipped said carrying truck with a target of a magnetic material, and with which said tunnel exterior was equipped.
[Claim 7]The tunnel conveying machine according to claim 6, wherein said linear motor type track is can-ized and it succeeds in magnetic levitation control and travel stop control of said carrying truck from said tunnel outside through this can.
[Claim 8]The tunnel conveying machine according to claim 1 to 7, wherein atmosphere inside said tunnel is a vacuum and atmosphere of the tunnel exterior is the atmosphere.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to a conveying machine, especially is provided with the suitable carrying truck for manufacture of a semiconductor, etc. which carries carried one in the inside of a tunnel, and relates to the tunnel conveying machine which conveys carried one where the open air is intercepted by a tunnel septum.
[0002]
[Description of the Prior Art]The necessity of conveying between process units, for example under a vacuum atmosphere has come out without putting processed materials, such as a wafer, to the open air, in order to require very advanced cleanliness about semiconductor manufacture etc. and to prevent particle contamination these days, or in order to prevent molecular contamination, such as oxidation. Two or more process units are tied with a vacuum tunnel conveying machine as the one method, and the trial which carries a wafer in a carrying truck and conveys the inside of a vacuum tunnel occurs. Drawing 12 shows the example of the semiconductor production line which combined two or more process units with the tunnel conveying machine.
[0003]Drawing 13 is the sectional view which met AA line shown in drawing 12. Process unit A and B use the both sides of the conveyance tunnel 7 for relativity, and it is arranged. Process unit A and B have the transfer robots 11 and 12 in the robot chamber 25, respectively, Transport the wafer 5 to the process chamber 26 of process unit A and B from the carrying truck 9 which runs in the tunnel conveying machine 7, or, Conversely, the wafer which carried out the end of processing by process unit A and B is taken out from process unit A and B, and is transported to the carrying truck 9, the carrying truck 9 runs in the tunnel carrying path 7, and it conveys to the following processing unit.
[0004]With a linear motor, a stop position arrangement device, etc. which were attached to the tunnel septum 8 exterior and which are not illustrated, this carrying truck 9 moves in the inside of the tunnel 7, conveys carried one 5, and stops to a position.
[0005]About a tunnel conveying machine, without a carrying truck contacting a tunnel septum inside a tunnel, The linear motor type track which can make it run a carrying truck is developed, and carried one, such as a wafer, can be conveyed between processing units under very pure environment, without generating particles inside a tunnel according to the conveying machine to apply. An example of the linear motor type track to apply is indicated in detail by this invention person etc. international patent application PCT/JP93/00930. The member in which this device has fear of the generation of gas, such as a magnetic pole sensor and an electromagnet, is arranged at the atmosphere side of a tunnel septum, The carrying truck in the inside of the open air and the intercepted tunnel is surfaced via a thin septum, and a carrying truck is run a carrying truck or stopped with the linear motor etc. which have been similarly arranged to the tunnel septum exterior. According to the linear motor type track to apply, it is also possible for a carrying truck to branch to direction crossing at a right angle, and to run in the tunnel which has branching which intersected perpendicularly.
[0006]

[Problem(s) to be Solved by the Invention]However, in the border area of such a process unit and a tunnel conveying machine, In the transfer between the process units which carry out for relativity of transporting the wafer 5 to process unit B from process unit A, Operation that once place the wafer 5 on the carrying truck 9, then the robot 12 of process unit B takes up the wafer 5 on the carrying truck 9, and the robot 11 of process unit A transports it into process unit B is performed. That is, between process unit A which carried out for relativity, and B, when delivering the wafer 5, in spite of not conveying the wafer 5, the carrying truck 9 must be used as a temporary table which delivers the wafer 5, and must be located between process unit A and B.When the carrying truck 9 was moving to other positions in the tunnel 7 by chance, the wafer 5 could not be delivered, a transfer of a wafer was not completed at time until the carrying truck 9 returns between process unit A and B, but there was a problem of taking the time for delivering a wafer.
[0007]Delivering the wafer 5 directly by the robots 11 and 12 between process unit A and B, as shown in drawing 14 is also considered. However, as shown in drawing 15 in such a case, the shape of the fingers 13 and 14 of a robot must be the shape in which it does not interfere mutually. However, the shape of the robot fingers 13 and 14 is already determined by the shape of the wafer table in a process unit, etc., change is rather difficult and it is not easy to make it not interfere between the robot fingers 13 and 14. For this reason, it cannot usually use transporting the wafer 5 directly by the fingers 13 and 14 of the robots 11 and 12 among the processing units A and B.
[0008]There is height of the wafer conveyance face of process unit A connected with process unit A and B as a problem of the border area between the conveyance tunnels 7 and B. The wafer conveyance faces of the common process unit differ for every device, and have various height. If it is going to connect these to a common tunnel conveying machine, for some transfer robots 11 and 12, the range of the up-and-down motion is restricted, and it may be difficult to deliver and receive a wafer from a carrying truck.
[0009]The wafer table inside a device moves up and down by process unit A and some B, and the robot 11 and 12 the very thing have some which cannot move up and down. In such a case, as shown in drawing 16, the middle robot chamber 27 is inserted between process unit A, B, and a conveyance tunnel, and wafer conveyance face height is adjusted by delivering and receiving a wafer via the robot 28 in this chamber 27. For this reason, the conveying machine of a wafer is enlarged and there is a problem of becoming expensive.
[0010]In view of the problem of the starting conventional technology, it succeeds in this invention, and it is a thing.
It is providing the tunnel conveying machine which can transport carried one, such as a wafer, smoothly in the border area of the purpose and a tunnel conveying machine.

[0011]
[Means for Solving the Problem]In a tunnel conveying machine which conveys carried one where a tunnel conveying machine of this invention was provided with a carrying truck which carries carried one in an inside of a tunnel and the open air is intercepted by a tunnel septum, A table which lays said carried one in an inside of said tunnel, and this table are moved to a sliding direction with the state where said inside of a tunnel intercepted the open air, and movement of this table was kept from passing of said carrying truck being barred.
[0012]
[Function]The table which lays carried one in the carrying truck stop position in the tunnel between process unit A and B, Since it had a means to move this table to a sliding direction after the inside of a tunnel has intercepted the open air, delivery of a wafer is attained between the robots of the process unit which faces to a tunnel via the table of a wafer. A table pushes up the wafer laid on the carrying truck when a carrying truck was also equipped with the opening penetrated to a sliding direction and the carrying truck had stopped according to an elevator mechanism from the bottom, Let the wafer on the table which went up in arbitrary positions be the structure where the robot finger of a process unit goes for a receipt. Restriction of a transfer robot's height is lost and Therefore, various kinds of wafer conveyance height, Without

using a middle transfer robot, also when a transfer robot cannot move the finger up and down, a process unit can be connected to a common conveyance tunnel, and a wafer can be delivered smoothly.

[0013]

[Example]Below, the 1st thru/or the 3rd example of this invention is described in detail, referring to an accompanying drawing. Drawing 1 thru/or drawing 2 show the tunnel conveying machine of the 1st example of this invention, drawing 1 shows arrangement with a process unit and a tunnel conveying machine, and drawing 2 shows the section composition between the tunnel conveying machine and process unit which met AA line in drawing 1. As shown in drawing 1, the opening 6 is formed in the conveyance tunnel septum 8 lower part at the halting point of the carrying truck 9 between the places to which a wafer may be transported via the conveyance tunnel 7, i.e., a process unit, and the table 1 which lays the wafer 5 in this opening 6 is arranged. Since the base material 2 is connected to the elevator 4, the table 1 is movable to a sliding direction. Since the bellows 3 expands and contracts with movement of the sliding direction of the table 1, the state where conveyance tunnel 7 inside was intercepted with the open air is held.

[0014]The table 1 of the wafer 5 has usually fallen in the opening 6 of the tunnel septum 8. When delivering the wafer 5 to process unit B from process unit A, the table 1 in which the wafer 5 is laid goes up in predetermined height, and the robot 11 of process unit A lays the wafer 5 on the table 1 by the finger 13 first. Then, the finger 14 of the robot 12 of process unit B takes up the wafer 5 from the table 1, and transports it into process unit B. When the elevator 4 moves caudad in the postposing stand 1, the table 1 falls in the opening 6 of the tunnel septum 8.

[0015]By drawing the finger 13 of the robot 11 in process unit A, and drawing the finger 14 of the robot 12 in process unit B, When it will be in the state where anything does not have a projection and a carrying truck stops or passes into this portion, since the wafer table 1 has fallen in the tunnel septum 8 lower part, the inside of the conveyance tunnel 7 does not produce the problem of barring passing of the carrying truck 9. when the carrying truck 9 stops in the position between process unit A and B, as shown in the Prior art, the carrying truck 9 or its wafer 5 conversely carried in the carrying truck 9 can be transported for the wafer 5 to the processing units A and B from process unit A or B.

[0016]Drawing 4 is a perspective view showing the structure of the carrying truck of the 1st example. The carrying truck 9 is equipped with the opening 10 penetrated to a sliding direction, and the table 1 which does not illustrate the inside of this opening 10 is movable to a sliding direction. The wafer 5 is supported by the pin 21 formed in the upper surface of the carrying truck 9, and is laid on the carrying truck 9. Although it is for the wheel 22 running a transportation direction the carrying truck 9, the magnetic devitation system conveying machine make carry out magnetic levitation of the carrying truck 9, and it is made to run by contact-ed from the septum 8 may be used, and the wheel 22 becomes unnecessary in this case. It is made for a linear motor type track to run in the state where it was made to rise to surface from the tunnel outside with the magnetic attraction power of the electromagnet for surfacing which equipped the carrying truck with the target of the magnetic material and with which the tunnel septum (can) exterior was equipped.

[0017]Drawing 5 thru/or drawing 7 show the conveyance tunnel in the tunnel conveying machine of the 2nd example of this invention, and the border area between process unit A and B. In this example, process unit A and process unit B differ so that the height of the conveyance face of a wafer may illustrate. Vertical movement shall be impossible for the robot 12 of process unit B, and the finger 14 of the robot 12 shall not fall to the wafer height on the carrying truck 9. Also in this example, like the 1st above-mentioned example, the table 1 can carry out vertical movement, where the open air is intercepted with the elevator 4 and the bellows 3. In the carrying truck 9, it has the opening 10 of the shape which can pass through the table 1 into the portion corresponding to the undersurface of the wafer 5 placed on the carrying truck as shown in drawing 4.

[0018]Next, operation of this example is explained. In the state of the beginning, the table 1 has fallen downward and is located in the opening 6 of the tunnel septum 8. In order for the carrying truck 9 to carry the wafer 5 and to transport the wafer 5 to process unit B in this state, it stops

to a predetermined stop position. As shown in drawing 5, the table 1 goes up from the opening 6 of the tunnel septum 8, and the wafer 5 is lifted through the inside of the opening 10 of the carrying truck 9 to the position shown in drawing 6. Next, as shown in drawing 6, the finger 14 of the robot 12 of process unit B extends, and it enters under the wafer 5. Next, as shown in drawing 6, lower the table 1, the finger 14 of the robot 12 is made to support the wafer 5, and the robot 12 of process unit B transports the wafer 5 into process unit B. The table 1 falls to the opening 6 of the septum 8, and the transportation vehicle 9 runs in the tunnel 7 to the next stop predetermined position.

[0019]The shape of the carrying truck 9 can consider various things as shown in drawing 8 thru/or drawing 9 other than the 1st example shown in drawing 4. In the carrying truck 9 of the 2nd example shown in drawing 8, it has the top plate 23 on the table 1 in which the wafer 5 is laid. Thereby, adhesion of the dust to the surface of the wafer 5 which is carried one, etc. is prevented.

[0020]Drawing 9 shows the shape of the carrying truck of the 3rd example. When the table 1 is carrying out the opening to the transportation direction like this example, In the carrying truck 9, the table 1 can run to the next destination in the stage which lifted the wafer 5 from the carrying truck 9, and it becomes possible for it to become unnecessary to stop to a spot place, and to raise the speed of a transfer of a wafer until the process of transfer of the wafer 5 is completed.

[0021]Drawing 10 thru/or drawing 11 show the border area between process unit A in the tunnel conveying machine of the 3rd example of this invention, and B. In this example, it has the opening 26 on the upper surface of the tunnel septum 8, and the table 1 is movable to a sliding direction via this opening 26. The structure where the table 1 is connected to the elevator 4 by the base material 2, the elevator 4 moves the table 1 to a sliding direction, and the open air is intercepted by the bellows 3 is the same as that of the 1st and 2nd above-mentioned example. Drawing 11 is a perspective view showing the shape of the table 1 which can be put on this example. The pin 21 which supports the wafer 5 is arranged in the table 1. The finger 13 of the robot 11 conveys the wafer 5 from the transverse direction of the table 1, and lays it on the pin 21.

[0022]The table 1 is used for transporting the wafer 5 to between process unit A and the process unit B chiefly in this example. The wafer 5 can be delivered to the table 1 by laying the wafer 5 in the finger 13 from process unit A, and lengthening the finger 13 of the robot 11 as an example of operation. The wafer 5 laid in the table 1 is inserted in the finger 14 of the robot 12 of process unit B by the wafer undersurface, and the wafer 5 is received and passed in process unit B by receiving the wafer 1 and pulling back the finger 14 in the process B.

[0023]The atmosphere in a conveyance tunnel is advanced clean atmospheres, such as a vacuum. The meaning of this invention is not limited to the above-mentioned example, and it is not necessary to say that various modification is possible. The numerals same in the inside of each figure show a same or considerable portion.

[0024]

[Effect of the Invention]It can carry out without using a carrying truck by going conveyance of a wafer via a table between the process units arranged on both sides of a tunnel conveying machine the 1st according to the conveying machine of this invention, as explained above. Even when the conveyance height of the wafer between process units differs in the 2nd, the table can adjust the height of a conveyance face easily from having the up-and-down moving mechanism. It enables this to transport carried one smoothly between process units.

[Translation done.]

TECHNICAL FIELD

[Industrial Application]This invention relates to a conveying machine, especially is provided with the suitable carrying truck for manufacture of a semiconductor, etc. which carries carried one in the inside of a tunnel, and relates to the tunnel conveying machine which conveys carried one where the open air is intercepted by a tunnel septum.

PRIOR ART

[Description of the Prior Art]The necessity of conveying between process units, for example under a vacuum atmosphere has come out without putting processed materials, such as a wafer, to the open air, in order to require very advanced cleanliness about semiconductor manufacture etc. and to prevent particle contamination these days, or in order to prevent molecular contamination, such as oxidation. Two or more process units are tied with a vacuum tunnel conveying machine as the one method, and the trial which carries a wafer in a carrying truck and conveys the inside of a vacuum tunnel occurs. Drawing 12 shows the example of the semiconductor production line which combined two or more process units with the tunnel conveying machine.
[0003]Drawing 13 is the sectional view which met AA line shown in drawing 12. Process unit A and B use the both sides of the conveyance tunnel 7 for relativity, and it is arranged. Process unit A and B have the transfer robots 11 and 12 in the robot chamber 25, respectively, Transport the wafer 5 to the process chamber 26 of process unit A and B from the carrying truck 9 which runs in the tunnel conveying machine 7, or, Conversely, the wafer which carried out the end of processing by process unit A and B is taken out from process unit A and B, and is transported to the carrying truck 9, the carrying truck 9 runs in the tunnel carrying path 7, and it conveys to the following processing unit.
[0004]With a linear motor, a stop position arrangement device, etc. which were attached to the tunnel septum 8 exterior and which are not illustrated, this carrying truck 9 moves in the inside of the tunnel 7, conveys carried one 5, and stops to a position.
[0005]About a tunnel conveying machine, without a carrying truck contacting a tunnel septum inside a tunnel, The linear motor type track which can make it run a carrying truck is developed, and carried one, such as a wafer, can be conveyed between processing units under very pure environment, without generating particles inside a tunnel according to the conveying machine to apply. An example of the linear motor type track to apply is indicated in detail by this invention person etc. international patent application PCT/JP93/00930. The member in which this device has fear of the generation of gas, such as a magnetic pole sensor and an electromagnet, is arranged at the atmosphere side of a tunnel septum, The carrying truck in the inside of the open air and the intercepted tunnel is surfaced via a thin septum, and a carrying truck is run a carrying truck or stopped with the linear motor etc. which have been similarly arranged to the tunnel septum exterior. According to the linear motor type track to apply, it is also possible for a carrying truck to branch to direction crossing at a right angle, and to run in the tunnel which has branching which intersected perpendicularly.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]It can carry out without using a carrying truck by going conveyance of a wafer via a table between the process units arranged on both sides of a tunnel conveying machine the 1st according to the conveying machine of this invention, as explained above. Even when the conveyance height of the wafer between process units differs in the 2nd, the table can adjust the height of a conveyance face easily from having the up-and-down moving mechanism. It enables this to transport carried one smoothly between process units.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the border area of such a process unit and a tunnel conveying machine, In the transfer between the process units which carry out for relativity of transporting the wafer 5 to process unit B from process unit A, Operation that once place the wafer 5 on the carrying truck 9, then the robot 12 of process unit B takes up the wafer 5 on the carrying truck 9, and the robot 11 of process unit A transports it into process unit B is performed. That is, between process unit A which carried out for relativity, and B, when delivering the wafer 5, in spite of not conveying the wafer 5, the carrying truck 9 must be used as a temporary table which delivers the wafer 5, and must be located between process unit A and B.When the carrying truck 9 was moving to other positions in the tunnel 7 by chance, the wafer 5 could not be delivered, a transfer of a wafer was not completed at time until the carrying truck 9 returns between process unit A and B, but there was a problem of taking the time for delivering a wafer.
[0007]Delivering the wafer 5 directly by the robots 11 and 12 between process unit A and B, as shown in drawing 14 is also considered. However, as shown in drawing 15 in such a case, the shape of the fingers 13 and 14 of a robot must be the shape in which it does not interfere mutually. However, the shape of the robot fingers 13 and 14 is already determined by the shape of the wafer table in a process unit, etc., change is rather difficult and it is not easy to make it not interfere between the robot fingers 13 and 14. For this reason, it cannot usually use transporting the wafer 5 directly by the fingers 13 and 14 of the robots 11 and 12 among the processing units A and B.
[0008]There is height of the wafer conveyance face of process unit A connected with process unit A and B as a problem of the border area between the conveyance tunnels 7 and B. The wafer conveyance faces of the common process unit differ for every device, and have various height. If it is going to connect these to a common tunnel conveying machine, for some transfer robots 11 and 12, the range of the up-and-down motion is restricted, and it may be difficult to deliver and receive a wafer from a carrying truck.
[0009]The wafer table inside a device moves up and down by process unit A and some B, and the robot 11 and 12 the very thing have some which cannot move up and down. In such a case, as shown in drawing 16, the middle robot chamber 27 is inserted between process unit A, B, and a conveyance tunnel, and wafer conveyance face height is adjusted by delivering and receiving a wafer via the robot 28 in this chamber 27. For this reason, the conveying machine of a wafer is enlarged and there is a problem of becoming expensive.
[0010]In view of the problem of the starting conventional technology, it succeeds in this invention, and it is a thing.
It is providing the tunnel conveying machine which can transport carried one, such as a wafer, smoothly in the border area of the purpose and a tunnel conveying machine.

MEANS

[Means for Solving the Problem]In a tunnel conveying machine which conveys carried one where a tunnel conveying machine of this invention was provided with a carrying truck which carries carried one in an inside of a tunnel and the open air is intercepted by a tunnel septum, A table which lays said carried one in an inside of said tunnel, and this table are moved to a sliding direction with the state where said inside of a tunnel intercepted the open air, and movement of this table was kept from passing of said carrying truck being barred.

[Translation done.]

OPERATION

[Function]The table which lays carried one in the carrying truck stop position in the tunnel between process unit A and B, Since it had a means to move this table to a sliding direction after the inside of a tunnel has intercepted the open air, delivery of a wafer is attained between the robots of the process unit which faces to a tunnel via the table of a wafer. A table pushes up the wafer laid on the carrying truck when a carrying truck was also equipped with the opening penetrated to a sliding direction and the carrying truck had stopped according to an elevator mechanism from the bottom, Let the wafer on the table which went up in arbitrary positions be the structure where the robot finger of a process unit goes for a receipt. Restriction of a transfer robot's height is lost and Therefore, various kinds of wafer conveyance height, Without using a middle transfer robot, also when a transfer robot cannot move the finger up and down, a process unit can be connected to a common conveyance tunnel, and a wafer can be delivered smoothly.

EXAMPLE

[Example]Below, the 1st thru/or the 3rd example of this invention is described in detail, referring to an accompanying drawing. Drawing 1 thru/or drawing 2 show the tunnel conveying machine of the 1st example of this invention, drawing 1 shows arrangement with a process unit and a tunnel conveying machine, and drawing 2 shows the section composition between the tunnel conveying machine and process unit which met AA line in drawing 1. As shown in drawing 1, the opening 6 is formed in the conveyance tunnel septum 8 lower part at the halting point of the carrying truck 9 between the places to which a wafer may be transported via the conveyance tunnel 7, i.e., a process unit, and the table 1 which lays the wafer 5 in this opening 6 is arranged. Since the base material 2 is connected to the elevator 4, the table 1 is movable to a sliding direction. Since the bellows 3 expands and contracts with movement of the sliding direction of the table 1, the state where conveyance tunnel 7 inside was intercepted with the open air is held.
[0014]The table 1 of the wafer 5 has usually fallen in the opening 6 of the tunnel septum 8. When delivering the wafer 5 to process unit B from process unit A, the table 1 in which the wafer 5 is laid goes up in predetermined height, and the robot 11 of process unit A lays the wafer 5 on the table 1 by the finger 13 first. Then, the finger 14 of the robot 12 of process unit B takes up the wafer 5 from the table 1, and transports it into process unit B. When the elevator 4 moves caudad in the postposing stand 1, the table 1 falls in the opening 6 of the tunnel septum 8.
[0015]By drawing the finger 13 of the robot 11 in process unit A, and drawing the finger 14 of the robot 12 in process unit B, When it will be in the state where anything does not have a projection and a carrying truck stops or passes into this portion, since the wafer table 1 has fallen in the tunnel septum 8 lower part, the inside of the conveyance tunnel 7 does not produce the problem of barring passing of the carrying truck 9. when the carrying truck 9 stops in the position between process unit A and B, as shown in the Prior art, the carrying truck 9 or its wafer 5 conversely carried in the carrying truck 9 can be transported for the wafer 5 to the processing units A and B from process unit A or B.
[0016]Drawing 4 is a perspective view showing the structure of the carrying truck of the 1st example. The carrying truck 9 is equipped with the opening 10 penetrated to a sliding direction, and the table 1 which does not illustrate the inside of this opening 10 is movable to a sliding direction. The wafer 5 is supported by the pin 21 formed in the upper surface of the carrying truck 9, and is laid on the carrying truck 9. Although it is for the wheel 22 running a transportation direction the carrying truck 9, the magnetic devitation system conveying machine make carry out magnetic levitation of the carrying truck 9, and it is made to run by contact-ed from the septum 8 may be used, and the wheel 22 becomes unnecessary in this case. It is made for a linear motor type track to run in the state where it was made to rise to surface from the tunnel outside with the magnetic attraction power of the electromagnet for surfacing which equipped the carrying truck with the target of the magnetic material and with which the tunnel septum (can) exterior was equipped.
[0017]Drawing 5 thru/or drawing 7 show the conveyance tunnel in the tunnel conveying machine of the 2nd example of this invention, and the border area between process unit A and B. In this example, process unit A and process unit B differ so that the height of the conveyance face of a wafer may illustrate. Vertical movement shall be impossible for the robot 12 of process unit B,

and the finger 14 of the robot 12 shall not fall to the wafer height on the carrying truck 9. Also in this example, like the 1st above-mentioned example, the table 1 can carry out vertical movement, where the open air is intercepted with the elevator 4 and the bellows 3. In the carrying truck 9, it has the opening 10 of the shape which can pass through the table 1 into the portion corresponding to the undersurface of the wafer 5 placed on the carrying truck as shown in drawing 4.

[0018]Next, operation of this example is explained. In the state of the beginning, the table 1 has fallen downward and is located in the opening 6 of the tunnel septum 8. In order for the carrying truck 9 to carry the wafer 5 and to transport the wafer 5 to process unit B in this state, it stops to a predetermined stop position. As shown in drawing 5, the table 1 goes up from the opening 6 of the tunnel septum 8, and the wafer 5 is lifted through the inside of the opening 10 of the carrying truck 9 to the position shown in drawing 6. Next, as shown in drawing 6, the finger 14 of the robot 12 of process unit B extends, and it enters under the wafer 5. Next, as shown in drawing 6, lower the table 1, the finger 14 of the robot 12 is made to support the wafer 5, and the robot 12 of process unit B transports the wafer 5 into process unit B. The table 1 falls to the opening 6 of the septum 8, and the transportation vehicle 9 runs in the tunnel 7 to the next stop predetermined position.

[0019]The shape of the carrying truck 9 can consider various things as shown in drawing 8 thru/or drawing 9 other than the 1st example shown in drawing 4. In the carrying truck 9 of the 2nd example shown in drawing 8, it has the top plate 23 on the table 1 in which the wafer 5 is laid. Thereby, adhesion of the dust to the surface of the wafer 5 which is carried one, etc. is prevented.

[0020]Drawing 9 shows the shape of the carrying truck of the 3rd example. When the table 1 is carrying out the opening to the transportation direction like this example, In the carrying truck 9, the table 1 can run to the next destination in the stage which lifted the wafer 5 from the carrying truck 9, and it becomes possible for it to become unnecessary to stop to a spot place, and to raise the speed of a transfer of a wafer until the process of transfer of the wafer 5 is completed.

[0021]Drawing 10 thru/or drawing 11 show the border area between process unit A in the tunnel conveying machine of the 3rd example of this invention, and B. In this example, it has the opening 26 on the upper surface of the tunnel septum 8, and the table 1 is movable to a sliding direction via this opening 26. The structure where the table 1 is connected to the elevator 4 by the base material 2, the elevator 4 moves the table 1 to a sliding direction, and the open air is intercepted by the bellows 3 is the same as that of the 1st and 2nd above-mentioned example. Drawing 11 is a perspective view showing the shape of the table 1 which can be put on this example. The pin 21 which supports the wafer 5 is arranged in the table 1. The finger 13 of the robot 11 conveys the wafer 5 from the transverse direction of the table 1, and lays it on the pin 21.

[0022]The table 1 is used for transporting the wafer 5 to between process unit A and the process unit B chiefly in this example. The wafer 5 can be delivered to the table 1 by laying the wafer 5 in the finger 13 from process unit A, and lengthening the finger 13 of the robot 11 as an example of operation. The wafer 5 laid in the table 1 is inserted in the finger 14 of the robot 12 of process unit B by the wafer undersurface, and the wafer 5 is received and passed in process unit B by receiving the wafer 1 and pulling back the finger 14 in the process B.

[0023]The atmosphere in a conveyance tunnel is advanced clean atmospheres, such as a vacuum. The meaning of this invention is not limited to the above-mentioned example, and it is not necessary to say that various modification is possible. The numerals same in the inside of each figure show a same or considerable portion.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The explanatory view showing the relation of arrangement of the tunnel conveying machine and process unit of each example of this invention.
[Drawing 2]It is the section lineblock diagram which met AA line in drawing 1 of the tunnel conveying machine of the 1st example of this invention, and the state where a wafer is transported via a table is shown.
[Drawing 3]The state where a wafer is transported is shown in a process unit from the carrying truck in drawing 2.
[Drawing 4]The perspective view showing the shape of the carrying truck of the 1st example.
[Drawing 5]The section lineblock diagram which met AA line in drawing 1 of the tunnel conveying machine of the 2nd example of this invention.
[Drawing 6]The state where the wafer in drawing 5 was lifted by the table is shown.
[Drawing 7]The state where a wafer is transported to process unit B in drawing 7 is shown.
[Drawing 8]The perspective view and cross-sectional view showing the shape of the carrying truck of the 2nd example.
[Drawing 9]The perspective view and cross-sectional view showing the shape of the carrying truck of the 3rd example.
[Drawing 10]The section lineblock diagram which met AA line in drawing 1 of the tunnel conveying machine of the 3rd example of this invention.
[Drawing 11]The perspective view showing the shape of the wafer table in the tunnel conveying machine of the 3rd example.
[Drawing 12]The explanatory view showing the relation of arrangement of a conventional tunnel conveying machine and process unit.
[Drawing 13]The section lineblock diagram which met AA line in drawing 1 of the conventional tunnel conveying machine.
[Drawing 14]The state of transporting a wafer by a robot finger directly between the process units of the both sides in drawing 13 is shown.
[Drawing 15]The plan showing the relation of the robot finger and wafer in drawing 14.
[Drawing 16]The explanatory view showing the state where the middle robot chamber has been arranged between a process unit and a tunnel conveying machine, in drawing 12.
[Drawing 17]The section lineblock diagram of BB line of drawing 16 at the time of providing a middle robot chamber between a process unit and a tunnel conveying machine.
[Description of Notations]
1 Table
2 Base material
3 Bellows
4 Elevator
5 Wafer
6 The opening of a tunnel septum
7 Conveyance tunnel
8 Tunnel septum

9 Carrying truck
10 Opening
11 and 12 Robot
13 and 14 Robot finger

[Translation done.]

* NOTICES *

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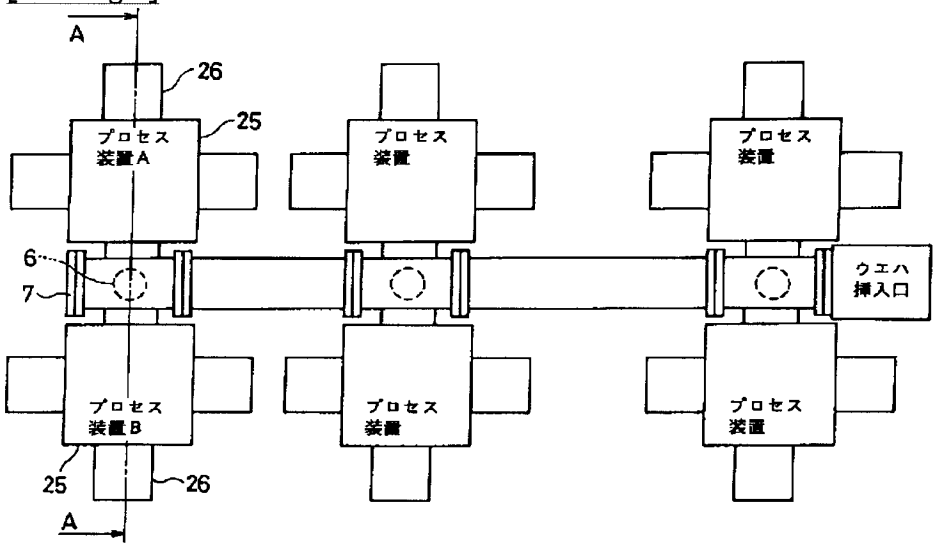
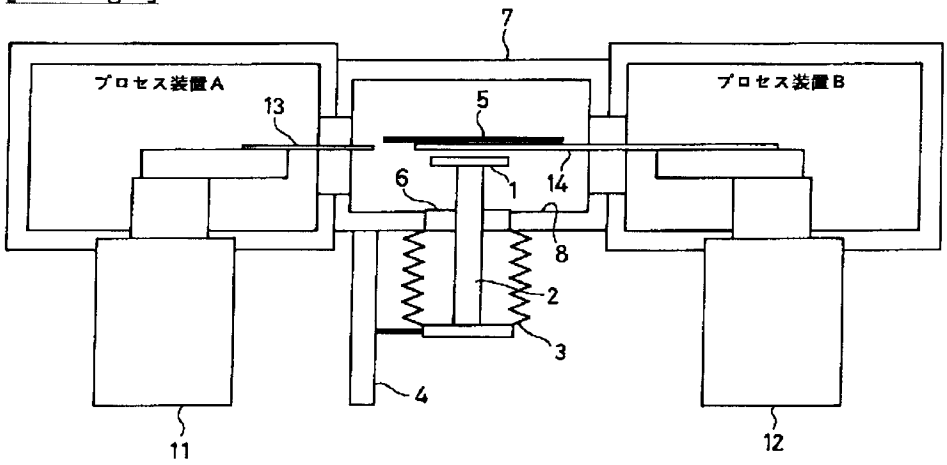
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



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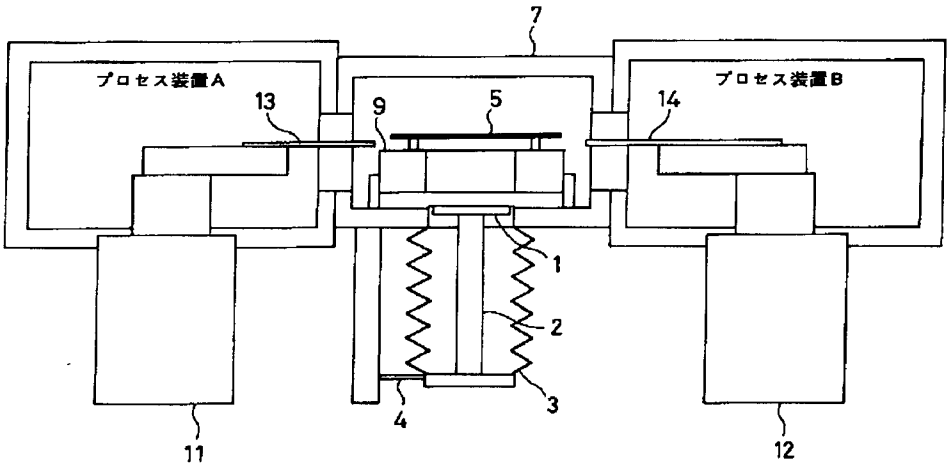

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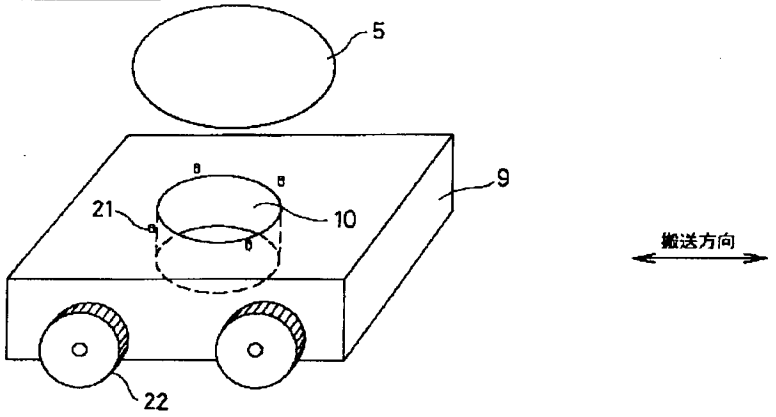

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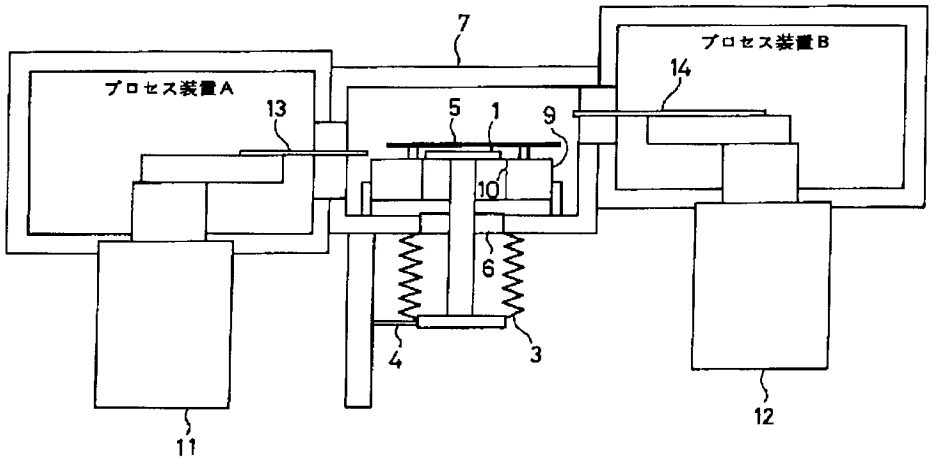

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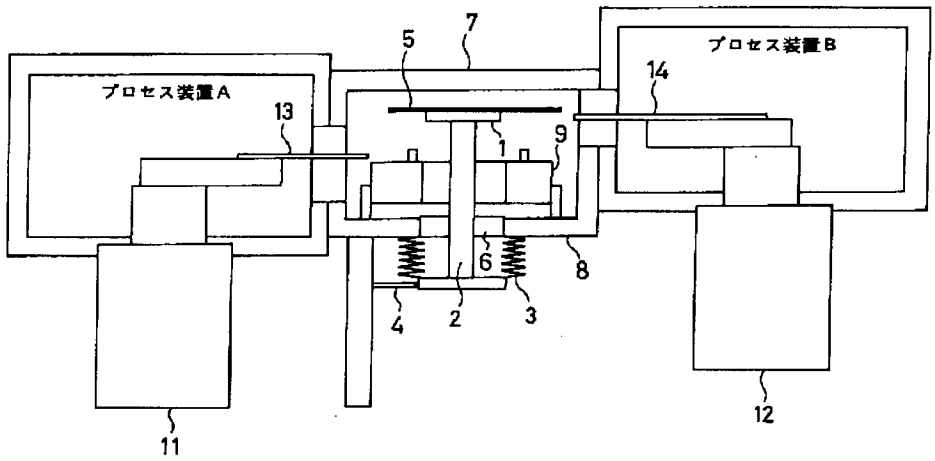

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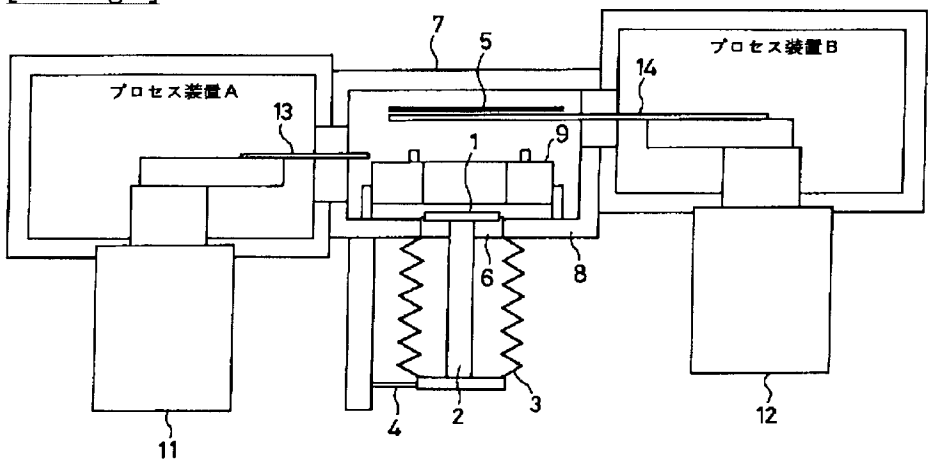

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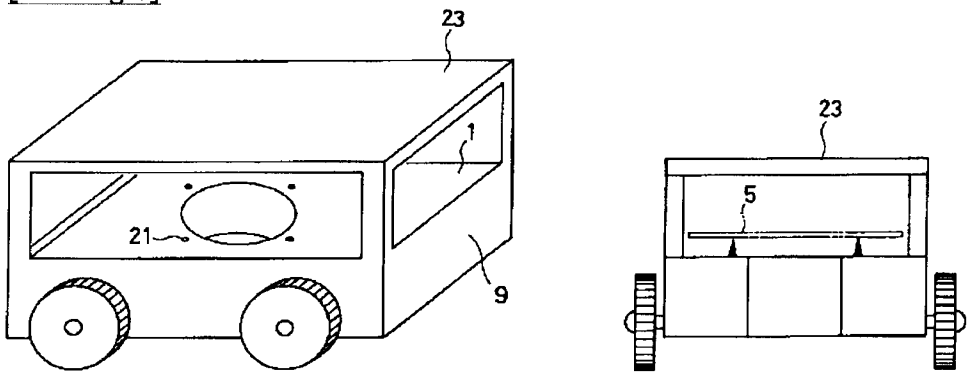

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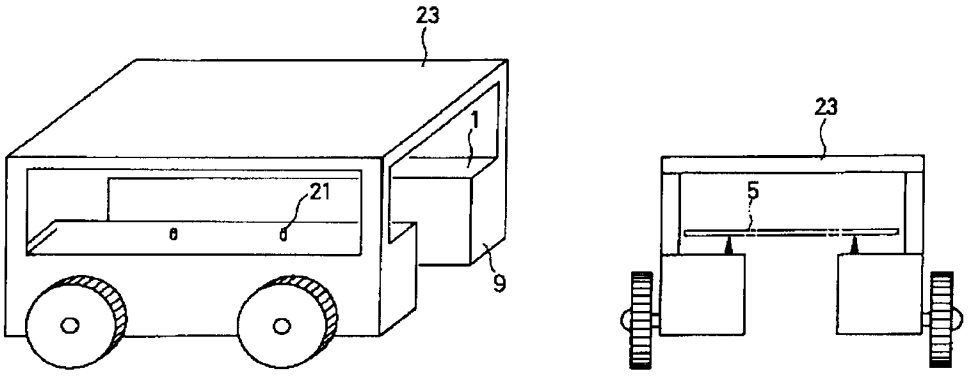

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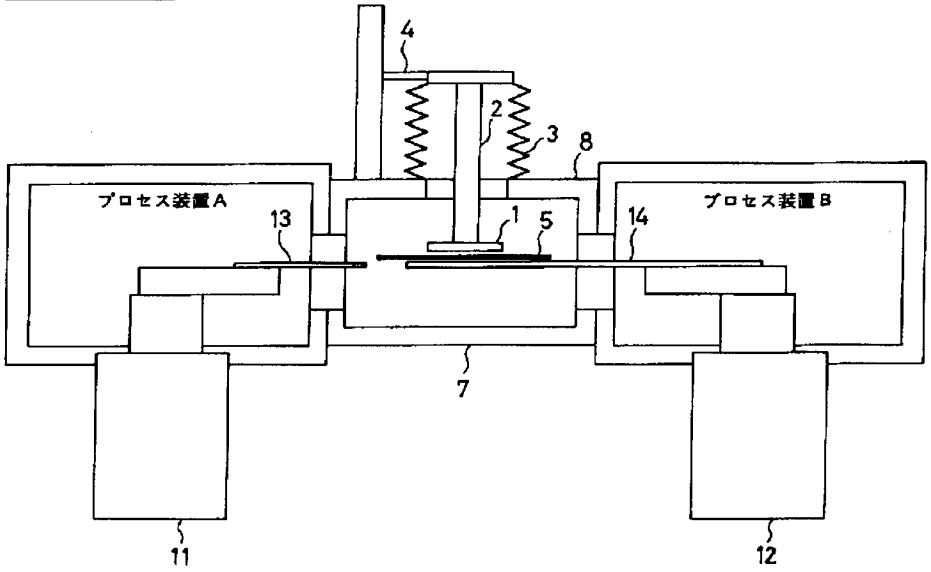

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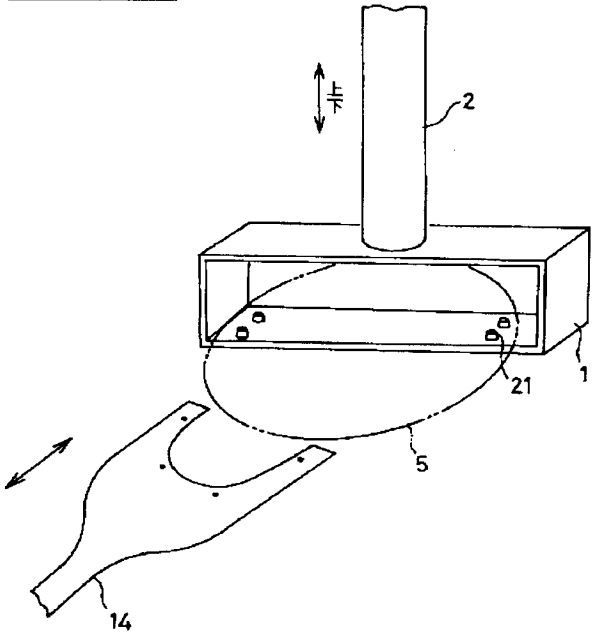
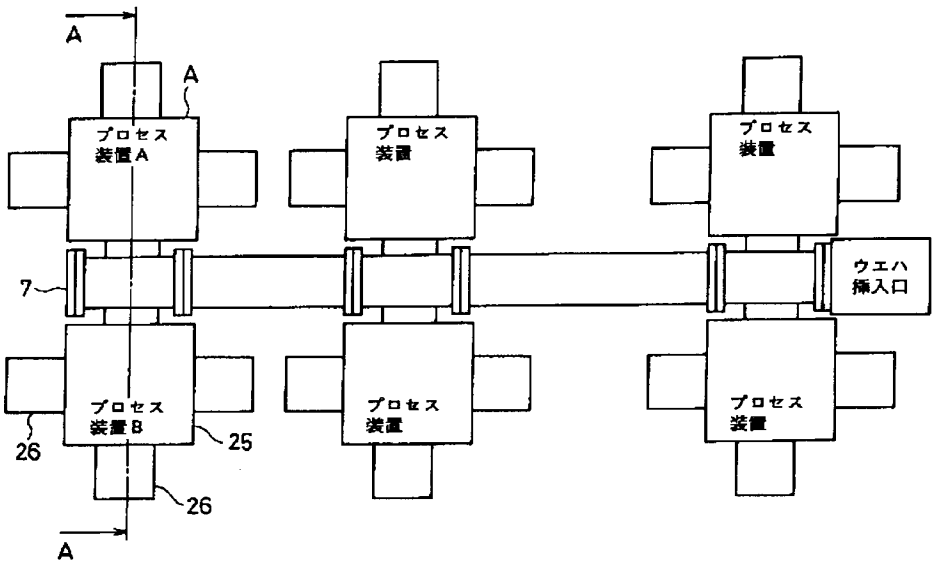


[Drawing 12]



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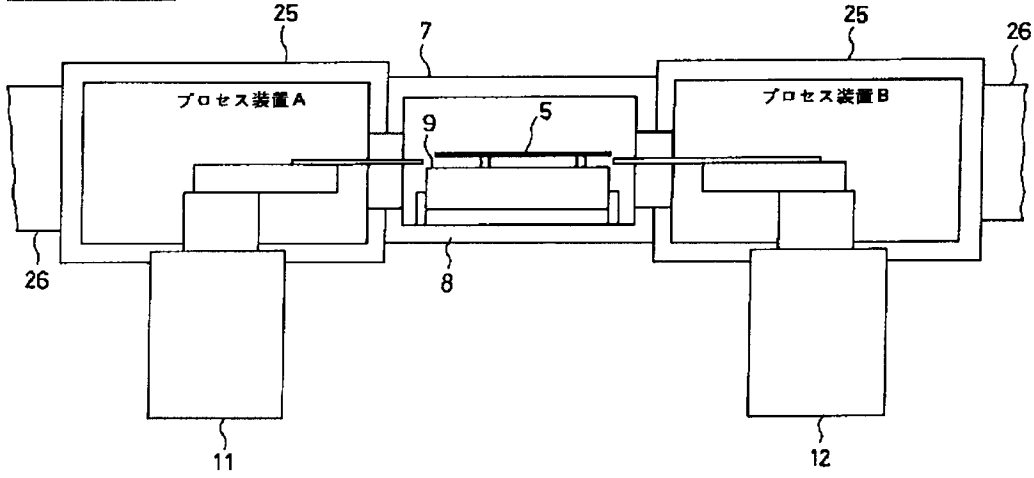

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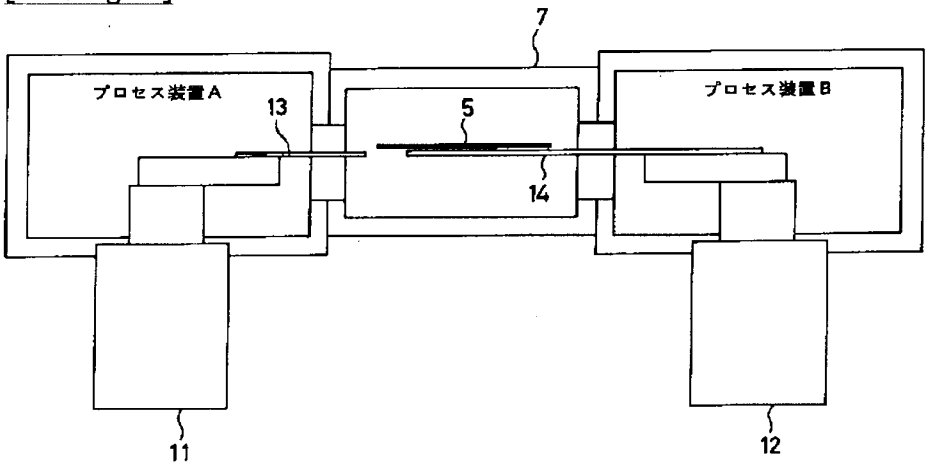
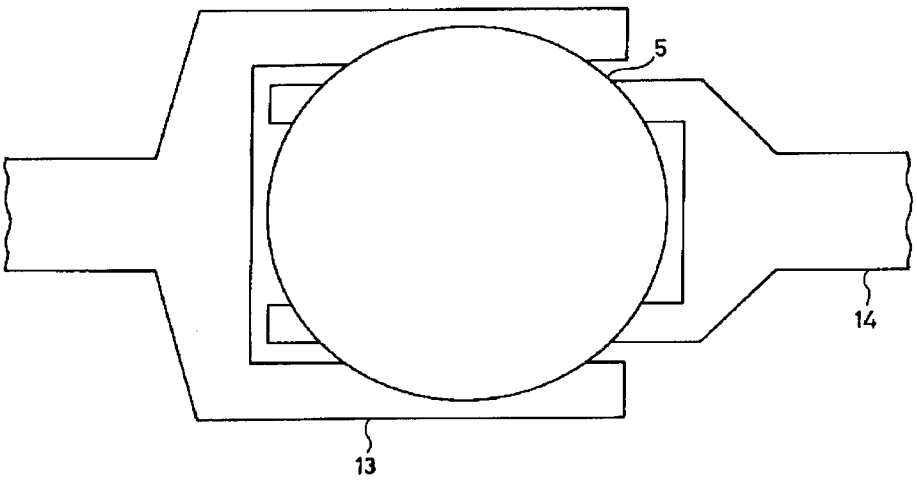
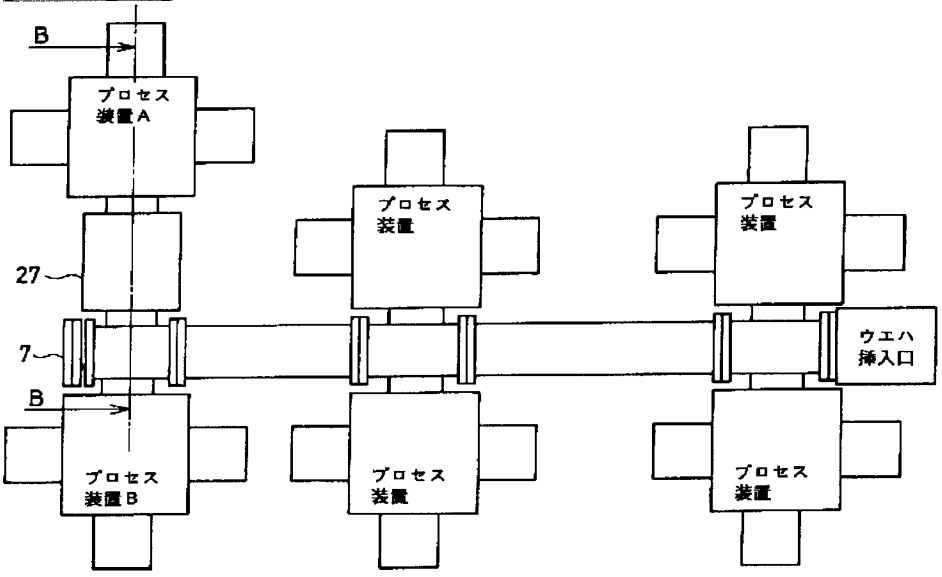


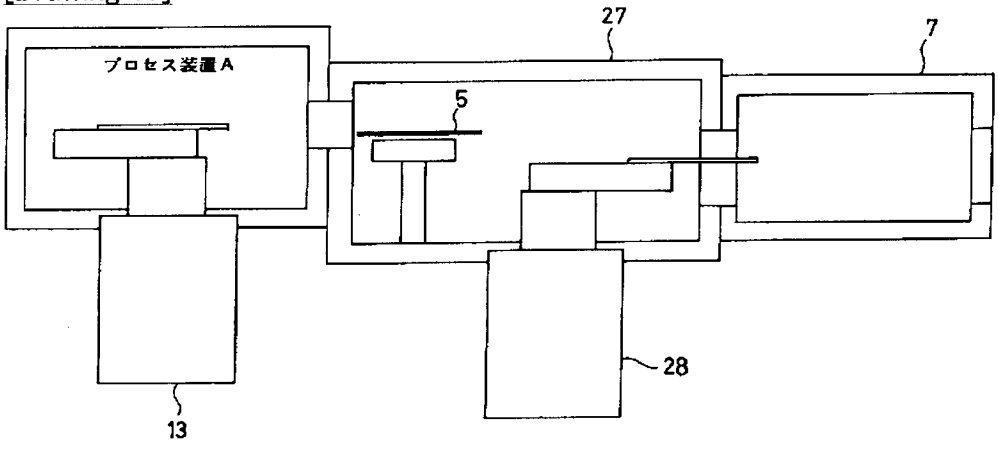
[Drawing 15]



[Drawing 16]



[Drawing 17]



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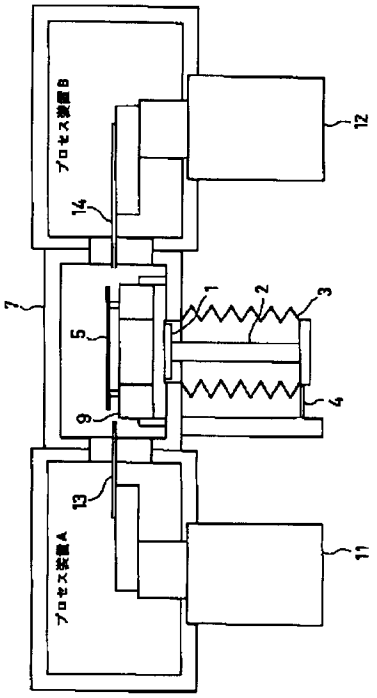
最終頁に続く

(54)【発明の名称】　搬送装置

(57)【要約】

【目的】　プロセス装置とトンネル搬送装置との境界領域においてスムーズにウエハ等の被搬送物を移送することのできるトンネル搬送装置を提供する。

【構成】　トンネル７内部に被搬送物を搭載する搬送台車９を備え、トンネル隔壁８により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置において、前記トンネル７内部に前記被搬送物５を載置する置台１と、該置台１を上下方向に前記トンネル７内部が外気を遮断した状態のまま移動し、該置台１の移動により前記搬送台車９の通行が妨げられないようにした。



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【特許請求の範囲】

【請求項１】　トンネル内部に被搬送物を搭載する搬送台車を備え、トンネル隔壁により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置において、前記トンネル内部に前記被搬送物を載置する置台と、該置台を上下方向に前記トンネル内部が外気を遮断した状態のまま移動し、該置台の移動により前記搬送台車の通行が妨げられないようにしたことを特徴とする搬送装置。

【請求項２】　前記搬送台車には上下方向に貫通する開口部を備え、該開口部内を前記置台が上下方向に移動可能であることを特徴とする請求項１記載のトンネル搬送装置。

【請求項３】　前記トンネル搬送装置の両側に配置された被搬送物を移送するロボットの搬送面の高さが異なり、前記搬送台車の上下方向に貫通する開口部内を前記置台を上下させる手段により、前記搬送面の高さが異なるロボット間に被搬送物を移送する手段を備えたことを特徴とする請求項２記載のトンネル搬送装置。

【請求項４】　前記置台は、前記トンネル隔壁の下面又は上面の開口部にベローズ機構及びエレベータ機構で機密封止されると共に上下方向に移動可能に支持されたものであることを特徴とする請求項１乃至３記載のトンネル搬送装置。

【請求項５】　前記トンネル搬送装置は磁気浮上搬送装置であることを特徴とする請求項１乃至４記載のトンネル搬送装置。

【請求項６】　前記磁気浮上搬送装置は、前記搬送台車には磁性材料のターゲットを備え、前記トンネル外部に備えられた浮上用電磁石の磁気吸引力によりトンネル外部から浮上させた状態で前記搬送台車を走行させるものであることを特徴とする請求項５記載のトンネル搬送装置。

【請求項７】　前記磁気浮上搬送装置はキャン化されており、前記搬送台車の磁気浮上制御及び走行停止制御は該キャンを通して前記トンネル外部から為されることを特徴とする請求項６記載のトンネル搬送装置。

【請求項８】　前記トンネル内部の雰囲気は真空であり、トンネル外部の雰囲気は大気であることを特徴とする請求項１乃至７記載のトンネル搬送装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は搬送装置に係り、特に半導体の製造等に好適な、トンネル内部に被搬送物を搭載する搬送台車を備え、トンネル隔壁により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置に関する。

【０００２】

【従来の技術】最近、半導体製造等に関して極めて高度の清浄度が要求され、粒子汚染を防ぐため、あるいは酸化等の分子汚染を防ぐために、ウエハ等の被処理物を外

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気に曝すことなく、例えば真空雰囲気下でプロセス装置間を搬送する必要が出てきている。その一つの方法として、真空トンネル搬送装置で複数のプロセス装置を結び、真空トンネル内をウエハを搬送台車に搭載して搬送する試みがある。図１２は、複数のプロセス装置をトンネル搬送装置で結合した半導体製造ラインの例を示している。

【０００３】図１３は、図１２に示すＡＡ線に沿った断面図である。搬送トンネル７の両側にプロセス装置Ａ，Ｂが相対向して配置されている。プロセス装置Ａ，Ｂはそれぞれロボットチャンバ２５に移載ロボット１１，１２を持っており、トンネル搬送装置７内を走行する搬送台車９からウエハ５をプロセス装置Ａ，Ｂのプロセスチャンバ２６へ移送したり、逆にプロセス装置Ａ，Ｂで処理終了したウエハを、プロセス装置Ａ，Ｂから取り出し搬送台車９に移送し、搬送台車９がトンネル搬送路７内を走行し次の処理装置へ搬送する。

【０００４】この搬送台車９は、トンネル隔壁８外部に取り付けられた図示しないリニアモータと停止位置決め装置等によって、トンネル７内を移動し被搬送物５を搬送し所定の位置に停止する。

【０００５】また、トンネル搬送装置については、トンネル内部で搬送台車がトンネル隔壁と接触することなく、搬送台車を走行させることができる磁気浮上搬送装置が開発されており、係る搬送装置によればトンネル内部で粒子を発生させることなく極めて清浄な環境下でウエハ等の被搬送物を処理装置間に搬送することができる。係る磁気浮上搬送装置の一例が、本発明者等により国際特許出願ＰＣＴ／ＪＰ９３／００９３０に詳細に開示されている。この装置は、磁極センサ、電磁石等ガス発生のおそれがある部材がトンネル隔壁の大気側に配置され、薄い隔壁を介して外気と遮断されたトンネル内部にある搬送台車を浮上させ、同様にトンネル隔壁外部に配置されたリニアモータ等により搬送台車を走行あるいは停止させる。また係る磁気浮上搬送装置によれば、直交した分岐を有するトンネル内を搬送台車は直交方向に分岐し走行することも可能である。

【０００６】

【発明が解決しようとする課題】しかしながら、このようなプロセス装置とトンネル搬送装置との境界領域においては、ウエハ５をプロセス装置Ａからプロセス装置Ｂに移送するというような相対向するプロセス装置間の移送の場合には、プロセス装置Ａのロボット１１はウエハ５をいったん搬送台車９上に置き、次にプロセス装置Ｂのロボット１２が搬送台車９上のウエハ５を取り上げプロセス装置Ｂ内へ移送するという動作が行われる。すなわち、相対向したプロセス装置Ａ，Ｂ間では、ウエハ５を受け渡すときには、搬送台車９はウエハ５を搬送する必要がないのにもかかわらず、ウエハ５を受け渡す一時的な置台としてプロセス装置Ａ，Ｂ間に位置していなけ

ればならない。搬送台車９がたまたまトンネル７内の他の位置に移動している場合にはウエハ５の受け渡しをすることができず、搬送台車９がプロセス装置Ａ，Ｂ間に戻るまでの時間にはウエハの移送ができず、ウエハの受け渡しをするための時間がかかるという問題があった。

【０００７】また、図１４に示すようにプロセス装置Ａ，Ｂ間のロボット１１，１２で直接ウエハ５を受け渡すことも考えられる。しかしながら、このような場合には図１５に示すように、ロボットのフィンガ１３，１４の形状が互いに干渉しない形状になっていなくてはならない。ところが、ロボットフィンガ１３，１４の形状はプロセス装置内のウエハ置台の形状等によりすでに決定されており、変更はなかなか難しく、ロボットフィンガ１３，１４間で干渉しないようにするのは容易でない。このため、処理装置Ａ，Ｂ間でロボット１１，１２のフィンガ１３，１４により直接ウエハ５を移送することは通常用いることができない。

【０００８】さらに、プロセス装置Ａ，Ｂと搬送トンネル７間の境界領域の問題点として、接続されるプロセス装置Ａ，Ｂのウエハ搬送面の高さがある。一般のプロセス装置のウエハ搬送面は装置ごとに異なっており種々の高さがある。これらを共通のトンネル搬送装置に接続しようとすると、移載ロボット１１，１２によっては、その上下動の範囲が限られており、搬送台車からウエハを授受することが困難な場合がある。

【０００９】また、プロセス装置Ａ，Ｂによっては装置内部のウエハ置台が上下動しロボット１１，１２自体は上下動できないものもある。このような場合には、図１６に示すようにプロセス装置Ａ，Ｂと搬送トンネルとの間に中間ロボットチャンバ２７を挿入し、このチャンバ２７内のロボット２８を経由してウエハの授受を行うことによりウエハ搬送面高さの調整を行っている。このため、ウエハの搬送装置が大型化してしまい高価になるという問題点がある。

【００１０】本発明は係る従来技術の問題点に鑑みて為されたものであり、プロセス装置とトンネル搬送装置との境界領域においてスムーズにウエハ等の被搬送物を移送することのできるトンネル搬送装置を提供することを目的とする。

【００１１】

【課題を解決するための手段】本発明のトンネル搬送装置は、トンネル内部に被搬送物を搭載する搬送台車を備え、トンネル隔壁により外気を遮断した状態で被搬送物を搬送するトンネル搬送装置において、前記トンネル内部に前記被搬送物を載置する置台と、該置台を上下方向に前記トンネル内部が外気を遮断した状態のまま移動し、該置台の移動により前記搬送台車の通行が妨げられないようにしたことを特徴とする。

【００１２】

【作用】プロセス装置Ａ，Ｂ間のトンネル内の搬送台車

停止位置に、被搬送物を載置する置台と、該置台を上下方向にトンネル内部が外気を遮断した状態で移動する手段とを備えたことから、ウエハの置台を経由してトンネルに対して相対するプロセス装置のロボット間でウエハの受け渡しが可能となる。更に、搬送台車にも、上下方向に貫通する開口を備え、搬送台車が停止しているときに搬送台車上に載置されたウエハを下からエレベータ機構により置台が押し上げ、任意の位置に上昇した置台上のウエハをプロセス装置のロボットフィンガが受け取りにいく構造としたものである。従って、移載ロボットの高さの制限がなくなり、各種のウエハ搬送高さ、また移載ロボットがそのフィンガを上下動できない場合にも、中間移載ロボットを使用することなしに、プロセス装置を共通の搬送トンネルに接続しウエハの受け渡しをスムーズに行うことができるようになる。

【００１３】

【実施例】以下に、本発明の第１乃至第３実施例を添付図面を参照しながら詳細に説明する。図１乃至図２は本発明の第１実施例のトンネル搬送装置を示し、図１はプロセス装置とトンネル搬送装置との配置を示し、図２は図１におけるＡＡ線に沿ったトンネル搬送装置とプロセス装置間の断面構成を示す。図１に示すように、搬送トンネル７を経由してウエハを移送する可能性のある場所、すなわちプロセス装置間の搬送台車９の停止点には搬送トンネル隔壁８下部に開口部６を設け、該開口部６にウエハ５を載置する置台１が配置されている。置台１は、支持体２がエレベータ４に接続されていることから、上下方向に移動可能である。また、置台１の上下方向の移動に伴いベローズ３が伸縮することから、搬送トンネル７内部は外気と遮断された状態が保持される。

【００１４】ウエハ５の置台１は、通常はトンネル隔壁８の開口部６に下がっている。プロセス装置Ａからプロセス装置Ｂへウエハ５を受け渡すときには、ウエハ５を載置する置台１が所定の高さに上昇し、まずプロセス装置Ａのロボット１１がそのフィンガ１３によりウエハ５を置台１の上に載置する。その後、プロセス装置Ｂのロボット１２のフィンガ１４がウエハ５を置台１から取り上げ、プロセス装置Ｂ内へ移送する。その後置台１はエレベータ４が下方に移動することにより置台１はトンネル隔壁８の開口部６に下がる。

【００１５】ロボット１１のフィンガ１３がプロセス装置Ａ内に引き込まれ、ロボット１２のフィンガ１４がプロセス装置Ｂ内に引き込まれることにより、搬送トンネル７内は突起物が何もない状態となり、搬送台車がこの部分に停止あるいは通過する場合は、ウエハ置台１がトンネル隔壁８下部に下がっているので搬送台車９の通行を妨げるという問題を生じない。搬送台車９がプロセス装置Ａ，Ｂ間の位置に停止した場合には、従来の技術に示したようにウエハ５をプロセス装置ＡあるいはＢから搬送台車９に、あるいはその逆に搬送台車９に搭載され

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たウエハ５を処理装置Ａ，Ｂへ移送することができる。

【００１６】図４は、第１実施例の搬送台車の構造を示す斜視図である。搬送台車９には上下方向に貫通する開口部１０を備え、該開口部１０内を図示しない置台１が上下方向に移動可能になっている。ウエハ５は搬送台車９の上面に設けられたピン２１によって支持され搬送台車９上に載置される。車輪２２は搬送台車９を搬送方向に走行させるためのものであるが、搬送台車９を磁気浮上させ隔壁８から被接触で走行させる磁気浮上式搬送装置を用いてもよく、この場合においては車輪２２は不要となる。尚、磁気浮上搬送装置は、搬送台車には磁性材料のターゲットを備え、トンネル隔壁（キャン）外部に備えられた浮上用電磁石の磁気吸引力によりトンネル外部から浮上させた状態で走行させるものである。

【００１７】図５乃至図７は本発明の第２実施例のトンネル搬送装置における搬送トンネルとプロセス装置Ａ，Ｂ間の境界領域を示す。本実施例では、プロセス装置Ａとプロセス装置Ｂとはウエハの搬送面の高さが図示するように異なっている。またプロセス装置Ｂのロボット１２は上下移動が不可能であり、ロボット１２のフィンガ１４は搬送台車９上のウエハ高さまで下がることができないものとする。本実施例においても前述の第１実施例と同様に置台１はエレベータ４及びベローズ３によって外気を遮断した状態で上下移動することが可能である。また、搬送台車９には図４に示すように搬送台車上に置かれたウエハ５の下面に対応する部分に、置台１が通過できる形状の開口部１０を有している。

【００１８】次に本実施例の動作について説明する。最初の状態では置台１は下に下がっており、トンネル隔壁８の開口部６に位置している。この状態で、搬送台車９がウエハ５を搭載してウエハ５をプロセス装置Ｂに移送するために所定の停止位置に停止する。図５に示すように、トンネル隔壁８の開口部６から置台１が上昇し、搬送台車９の開口部１０内を通ってウエハ５を図６に示す位置まで持ち上げる。次に、図６に示すようにプロセス装置Ｂのロボット１２のフィンガ１４が延びてウエハ５の下に入る。次に図６に示すように、置台１を下げ、ウエハ５をロボット１２のフィンガ１４に支持させ、プロセス装置Ｂのロボット１２がウエハ５をプロセス装置Ｂ内へ移送する。置台１は隔壁８の開口部６まで下がり、搬送車９はトンネル７内を次の停止予定位置に走行する。

【００１９】なお、搬送台車９の形状は図４に示す第１実施例の他に図８乃至図９に示すような種々のものが考えられる。図８に示す第２実施例の搬送台車９では、ウエハ５が載置される置台１の上に天板２３を備えている。これにより、被搬送物であるウエハ５の表面への塵埃等の付着が防止される。

【００２０】図９は、第３実施例の搬送台車の形状を示す。本実施例のように置台１が搬送方向に対して開口し

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ている場合には、置台１がウエハ５を搬送台車９から持ち上げた段階で搬送台車９は次の目的地へ走行でき、ウエハ５の授受の工程が終了するまでその場所へ止まる必要がなくなり、ウエハの移送の速度を向上させることが可能となる。

【００２１】図１０乃至図１１は、本発明の第３実施例のトンネル搬送装置におけるプロセス装置Ａ，Ｂ間の境界領域を示す。本実施例においては、トンネル隔壁８の上面に開口２６を有し、置台１は該開口２６を介して上下方向に移動可能となっている。置台１が、支持体２によりエレベータ４に接続され、エレベータ４が置台１を上下方向に移動させ、ベローズ３により外気が遮断されている構造は前述の第１、第２の実施例と同様である。図１１は、本実施例に置ける置台１の形状を示す斜視図である。置台１にはウエハ５を支持するピン２１が配置されている。ロボット１１のフィンガ１３は、置台１の横方向からウエハ５を搬送しピン２１上に載置する。

【００２２】本実施例においては、置台１は専らプロセス装置Ａとプロセス装置Ｂ間へウエハ５を移送することに用いられる。動作の一例として、プロセス装置Ａからフィンガ１３にウエハ５を載置しロボット１１のフィンガ１３を伸ばすことによりウエハ５を置台１に受け渡すことができる。置台１に載置されたウエハ５を、プロセス装置Ｂのロボット１２のフィンガ１４がウエハ下面に挿入され、ウエハ１を受取りプロセスＢ内にフィンガ１４を引き戻すことにより、ウエハ５はプロセス装置Ｂ内に受け渡される。

【００２３】尚、搬送トンネル内の雰囲気は、真空等の高度の清浄雰囲気となっている。本発明の趣旨は上記実施例に限定されるものでなく種々の変形が可能であることは云うまでもない。又、各図中同一の符号は同一又は相当部分を示す。

【００２４】

【発明の効果】以上に説明したように本発明の搬送装置によれば、第１にトンネル搬送装置の両側に配置されたプロセス装置間でウエハの搬送を置台を経由することによって搬送台車を用いることなく行うことができる。また、第２にプロセス装置間のウエハの搬送高さが異なるような場合でも、置台は上下の移動機構を備えていることから容易に搬送面の高さを調整することができる。これにより、プロセス装置間でスムーズに被搬送物を移送することが可能となる。

【図面の簡単な説明】

【図１】本発明の各実施例のトンネル搬送装置とプロセス装置の配置の関係を示す説明図。

【図２】本発明の第１実施例のトンネル搬送装置の図１におけるＡＡ線に沿った断面構成図であり、置台を介してウエハが移送される状態を示す。

【図３】図２における搬送台車からプロセス装置にウエハが移送される状態を示す。

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【図４】第１実施例の搬送台車の形状を示す斜視図。

【図５】本発明の第２実施例のトンネル搬送装置の図１におけるＡＡ線に沿った断面構成図。

【図６】図５におけるウエハが置台により持ち上げられた状態を示す。

【図７】図７におけるプロセス装置Ｂにウエハが移送される状態を示す。

【図８】第２実施例の搬送台車の形状を示す斜視図及び横断面図。

【図９】第３実施例の搬送台車の形状を示す斜視図及び横断面図。

【図１０】本発明の第３実施例のトンネル搬送装置の図１におけるＡＡ線に沿った断面構成図。

【図１１】第３実施例のトンネル搬送装置におけるウエハ置台の形状を示す斜視図。

【図１２】従来のトンネル搬送装置とプロセス装置の配置の関係を示す説明図。

【図１３】従来のトンネル搬送装置の図１におけるＡＡ線に沿った断面構成図。

【図１４】図１３における両側のプロセス装置間に直接ロボットフィンガによりウエハの移送を行う状態を示す。

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【図１５】図１４におけるロボットフィンガとウエハとの関係を示す上面図。

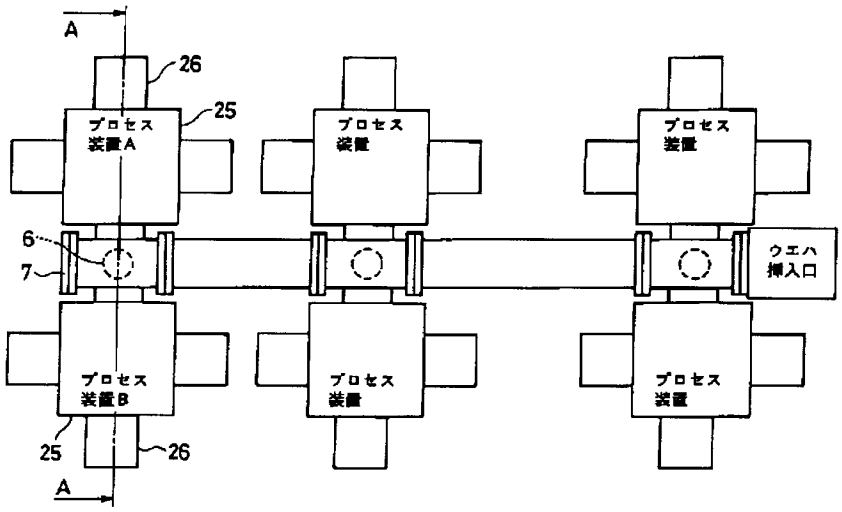
【図１６】図１２において、中間ロボットチャンバをプロセス装置とトンネル搬送装置間に配置した状態を示す説明図。

【図１７】プロセス装置とトンネル搬送装置間に中間ロボットチャンバを設けた場合の図１６のＢＢ線の断面構成図。

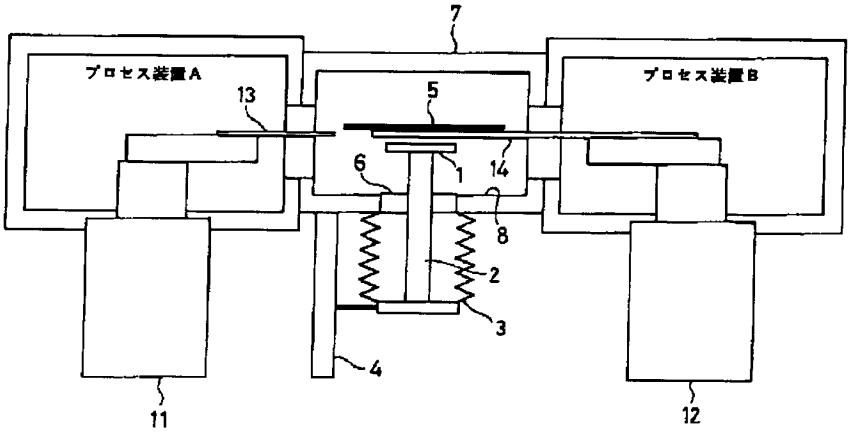
【符号の説明】

１　置台
２　支持体
３　ベローズ
４　エレベータ
５　ウエハ
６　トンネル隔壁の開口部
７　搬送トンネル
８　トンネル隔壁
９　搬送台車
１０　開口部
１１，１２　ロボット
１３，１４　ロボットフィンガ

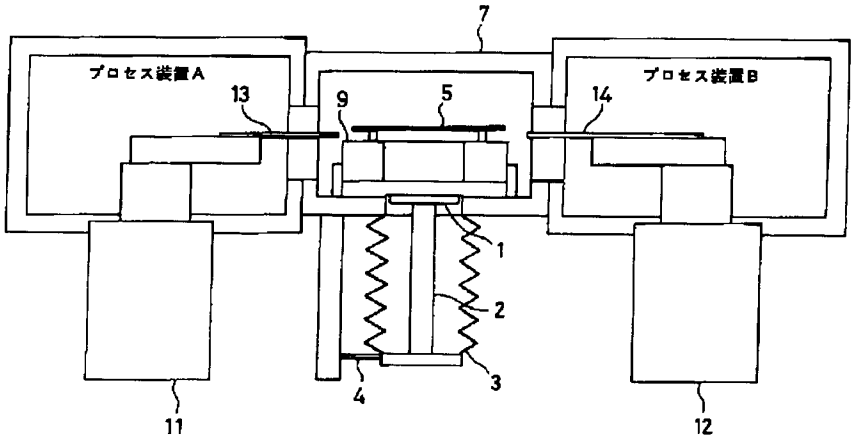
【図１】



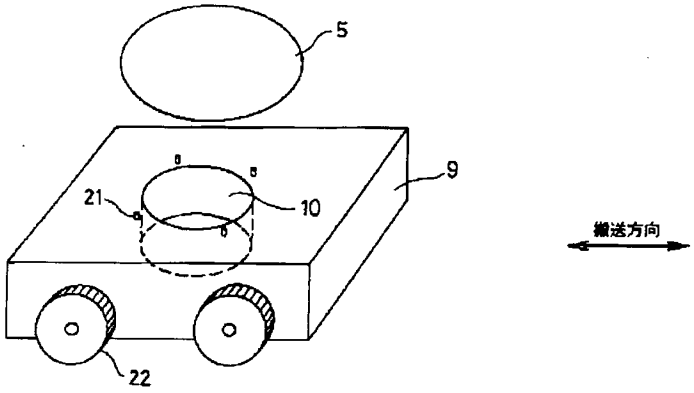
【図2】


7
プロセス装置A
プロセス装置B
13
5
6
1
14
8
2
3
4
11
12

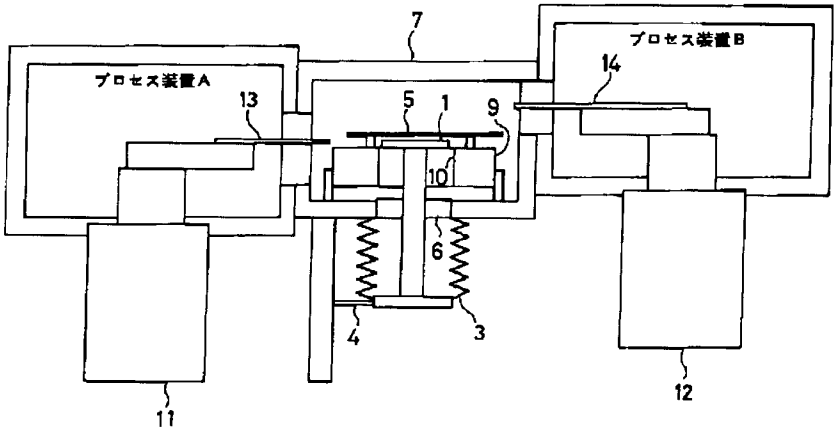
【図3】


7
プロセス装置A
プロセス装置B
13
9
5
14
1
2
3
4
11
12

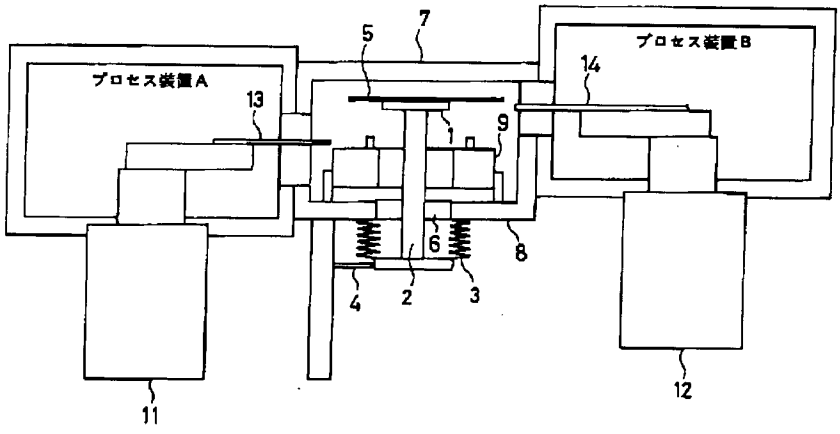
【図4】


5
9
21
10
22
搬送方向

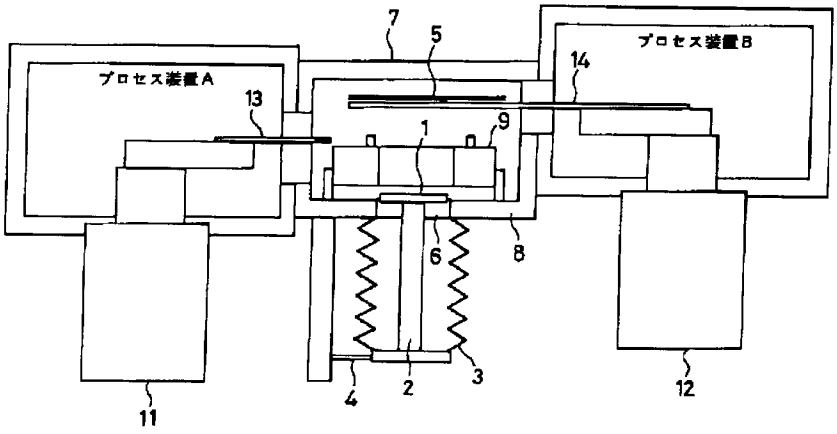
【図5】


プロセス装置A
プロセス装置B
7
13
5
1
9
14
10
6
4
3
11
12

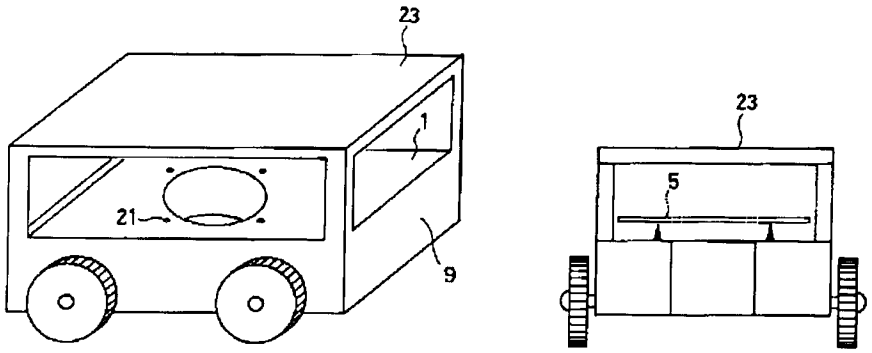
【図6】


プロセス装置A
プロセス装置B
5
7
13
14
1
9
6
8
4
2
3
11
12

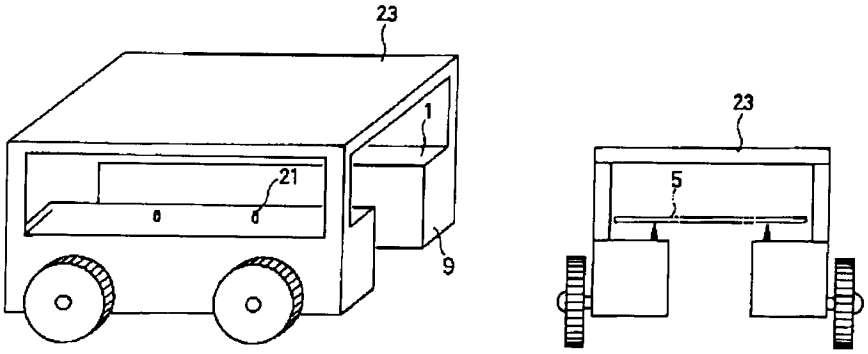
【図7】


プロセス装置A
プロセス装置B
7
5
13
14
1
9
6
8
4
2
3
11
12

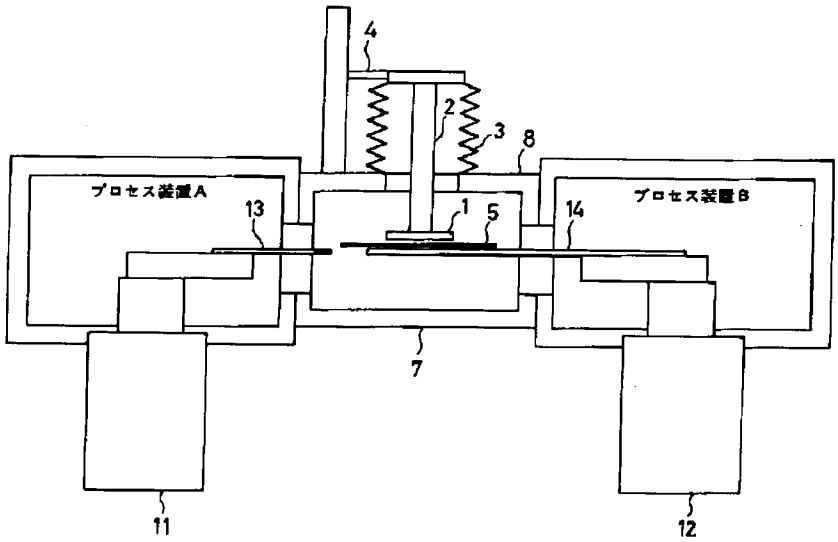
【図8】



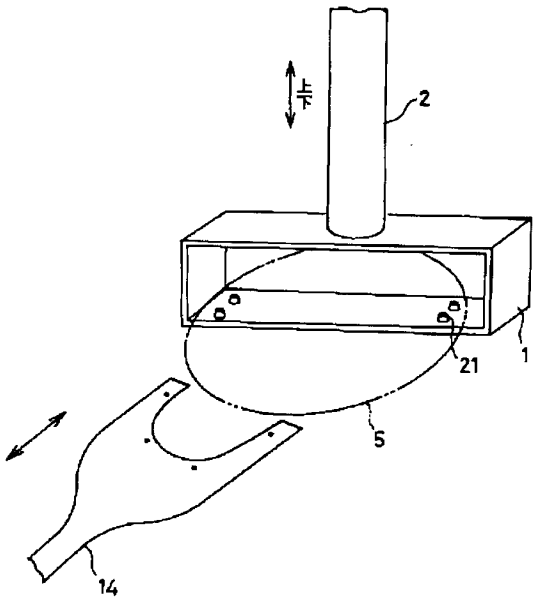
【図9】



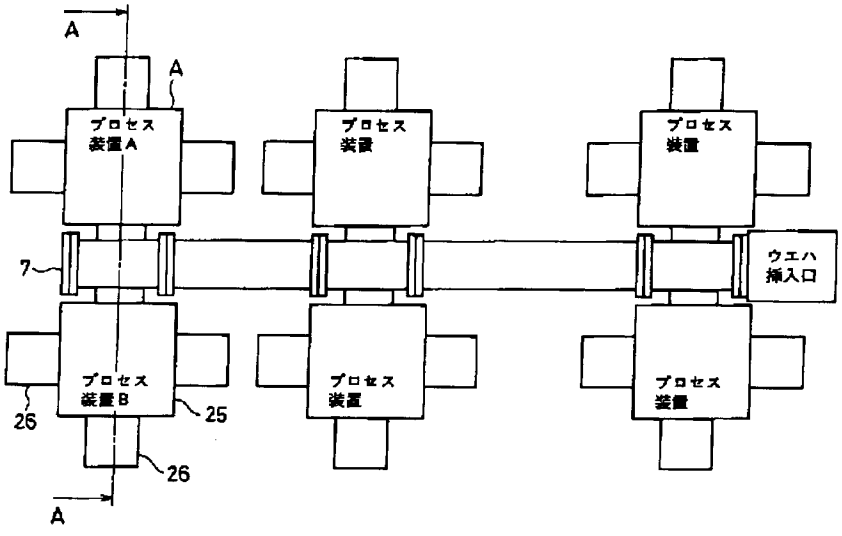
【図10】



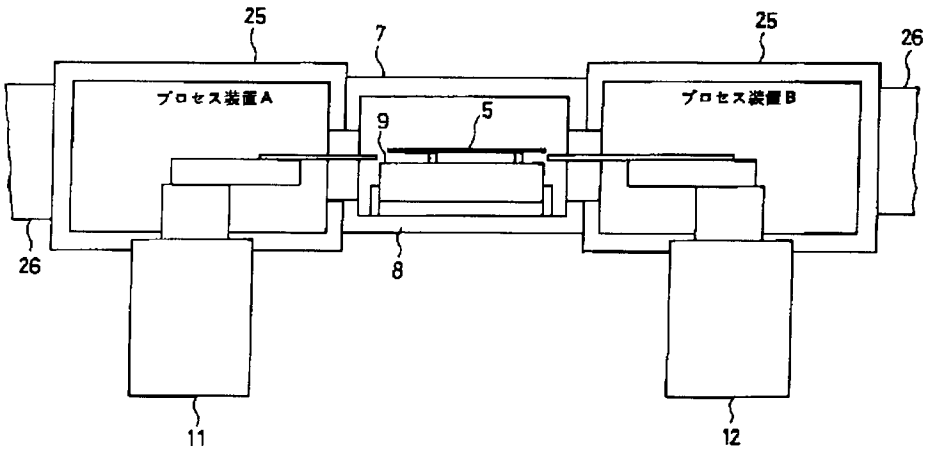
【図１１】


上下
2
21
1
5
14

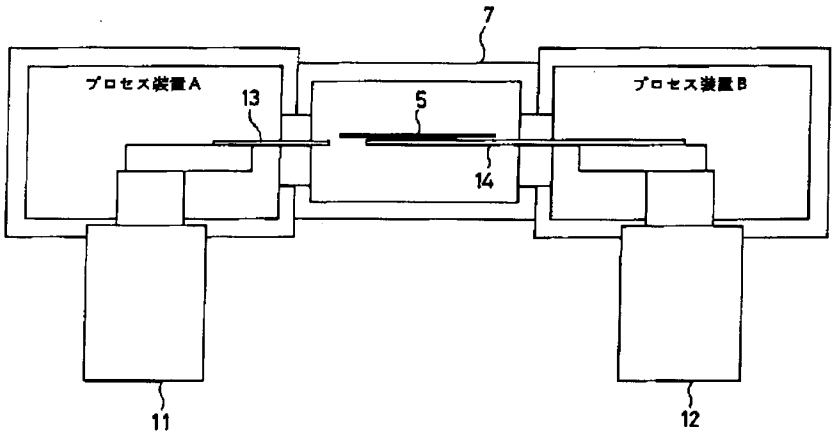
【図１２】


A
A
プロセス
装置A
プロセス
装置
プロセス
装置
7
ウエハ
挿入口
プロセス
装置B
プロセス
装置
プロセス
装置
26
25
26
A

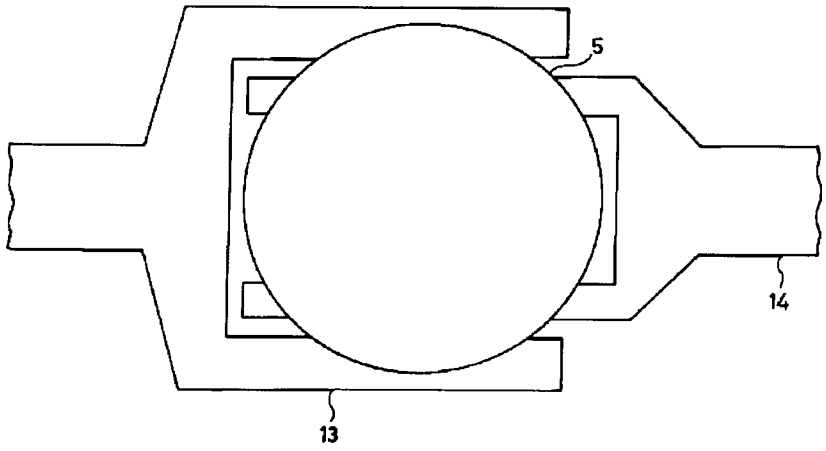
【図１３】


25
7
25
26
プロセス装置A
プロセス装置B
9
5
26
8
11
12

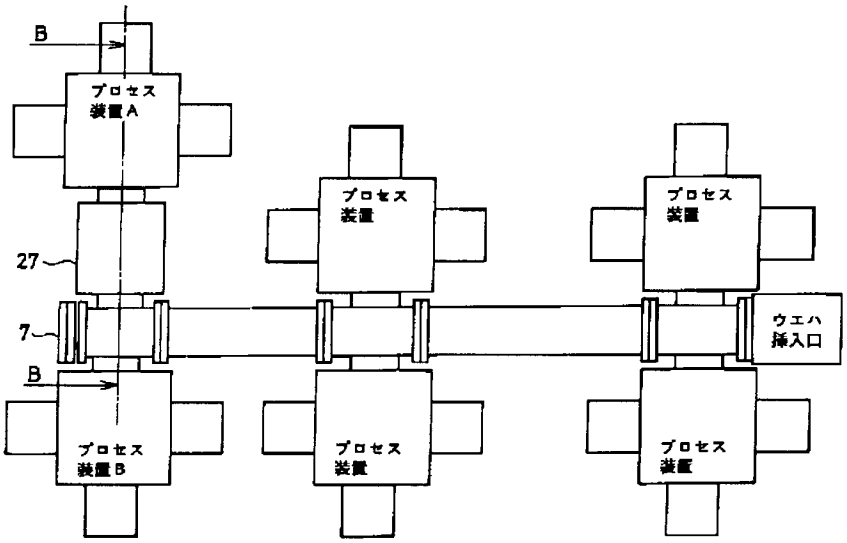
【図１４】


7
プロセス装置A
プロセス装置B
13
5
14
11
12

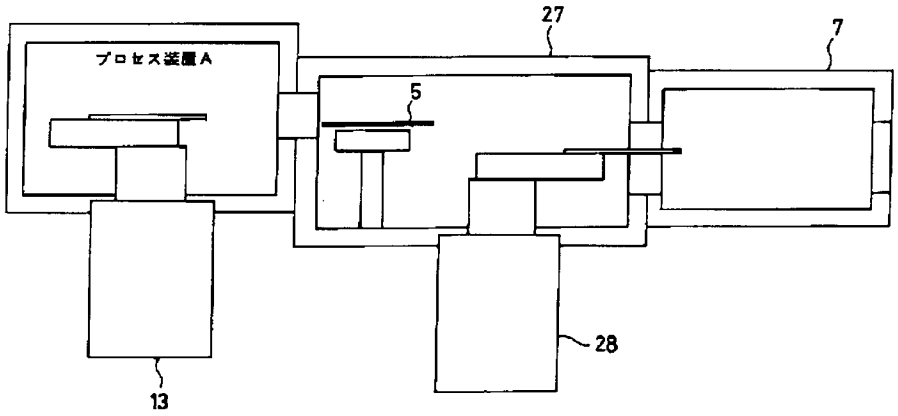
【図１５】


5
14
13

【図１６】



【図１７】



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